

1 Those skilled in the art will appreciate that the program steps and associated
2 data used to implement the embodiments described above can be implemented
3 using disc storage as well as other forms of storage including Read Only Memory
4 (ROM) devices, Random Access Memory (RAM) devices; optical storage elements,
5 magnetic storage elements, magneto-optical storage elements, flash memory, core
6 memory and/or other equivalent storage technologies without departing from the
7 present invention. Such alternative storage devices should be considered
8 equivalents.

9 The present invention is preferably implemented using a programmed
10 processor executing programming instructions that are broadly described above in
11 flow chart form that can be stored on any suitable electronic storage medium or
12 transmitted over any suitable electronic communication medium. However, those
13 skilled in the art will appreciate that the processes described above can be
14 implemented in any number of variations and in many suitable programming
15 languages without departing from the present invention. For example, the order of
16 certain operations carried out can often be varied, and additional operations can be
17 added without departing from the invention. Error trapping can be added and/or
18 enhanced and variations can be made in user interface and information
19 presentation without departing from the present invention. Such variations are
20 contemplated and considered equivalent.

21 While the invention has been described in conjunction with specific
22 embodiments, it is evident that many alternatives, modifications, permutations and
23 variations will become apparent to those skilled in the art in light of the foregoing
24 description. Accordingly, it is intended that the present invention embrace all such
25 alternatives, modifications and variations as fall within the scope of the appended
26 claims.

27 What is claimed is:
28

- 1 1. An external storage device for a personal video recorder (PVR) or television
2 Set-Top Box (STB), comprising:
3 means for receiving an encrypted and filtered MPEG transport stream, the
4 filtered MPEG transport stream containing only components having content related
5 to a single program;
6 a decrypter that decrypts the encrypted and filtered MPEG transport stream
7 to produce a filtered MPEG transport stream;
8 a demultiplexer that receives the filtered MPEG transport stream and extracts
9 an MPEG table therefrom;
10 a formatter that reinserts an MPEG table back into the filtered MPEG
11 transport stream to produce a modified MPEG transport stream, the reinserted
12 table containing only information relevant to the single program; and
13 a disc drive that stores the modified MPEG transport stream.
- 14
- 15 2. The apparatus according to claim 1, further comprising an encrypter that
16 encrypts the modified transport stream.
- 17
- 18 3. The apparatus according to claim 2, wherein the encrypter encrypts the
19 modified transport stream prior to storage in the disc drive so that the disc drive
20 stores an encrypted version of the modified transport stream.
- 21
- 22 4. The apparatus according to claim 2, wherein the encrypter encrypts the
23 modified MPEG transport stream using 5C decryption.
- 24
- 25 5. The apparatus according to claim 3, wherein the encrypter encrypts the
26 modified MPEG transport stream using 5C decryption.
- 27
- 28 6. The apparatus according to claim 1, wherein the MPEG table comprises at
29 least one of a program association table (PAT) and a program map table (PMT).
- 30

1 7. The apparatus according to claim 1, wherein the demultiplexer extracts
2 MPEG tables comprising a program association table (PAT) and a program map
3 table (PMT); and wherein the formatter reinserts the MPEG PAT and PMT tables
4 back into the filtered MPEG transport stream to produce a modified MPEG
5 transport stream, the reinserted tables containing only information relevant to the
6 single program.

7
8 8. The apparatus according to claim 1, wherein the demultiplexer further
9 extracts an entitlement control message (ECM) from the filtered transport stream.

10
11 9. The apparatus according to claim 1, wherein the means for receiving an
12 encrypted and filtered MPEG transport stream receives the encrypted and filtered
13 MPEG transport stream over an IEEE 1394 bus.

14
15 10. The apparatus according to claim 9, wherein the encrypted and filtered
16 MPEG transport stream is received as isochronous data over the IEEE 1394 bus.

17
18 11. The apparatus according to claim 1, wherein the MPEG table extracted by
19 the demultiplexer is sent over an IEEE 1394 bus.

20
21 12. The apparatus according to claim 11, wherein the MPEG table extracted by
22 the demultiplexer is sent as asynchronous data over the IEEE 1394 bus.

23
24 13. The apparatus according to claim 1, wherein the formatter receives the
25 MPEG table to be reinserted over an IEEE 1394 bus.

26
27 14. The apparatus according to claim 13, wherein the formatter receives the
28 MPEG table to be reinserted as asynchronous data over the IEEE 1394 bus.
29

1 16. An adapter for adapting an external storage device for storing information
2 from a personal video recorder (PVR) or television Set-Top Box (STB),
3 comprising:

4 means for receiving an encrypted and filtered MPEG transport stream, the
5 filtered MPEG transport stream containing only components having content related
6 to a single program;

7 a decrypter that decrypts the encrypted and filtered MPEG transport stream
8 to produce a filtered MPEG transport stream;

9 a demultiplexer that receives the filtered MPEG transport stream and extracts
10 an MPEG table therefrom;

11 a formatter that reinserts an MPEG table back into the filtered MPEG
12 transport stream to produce a modified MPEG transport stream, the reinserted
13 table containing only information relevant to the single program; and

14 means for coupling the modified MPEG transport stream to a disc drive.

15
16 17. The apparatus according to claim 16, further comprising an encrypter and
17 wherein the encrypter encrypts the modified transport stream before coupling to the
18 disc drive so that the disc drive stores an encrypted version of the modified
19 transport stream.

20
21 18. The apparatus according to claim 17, wherein the encrypter encrypts the
22 modified MPEG transport stream using 5C decryption.

23
24 19. The apparatus according to claim 17, wherein the MPEG tables comprise
25 at least one of a program association table (PAT) and a program map table (PMT).
26

1 20. The apparatus according to claim 17, wherein the demultiplexer extracts
2 MPEG tables comprising a program association table (PAT) and a program map
3 table (PMT), and wherein the formatter reinserts the MPEG PAT and PMT tables
4 back into the filtered MPEG transport stream to produce a modified MPEG
5 transport stream, the reinserted tables containing only information relevant to the
6 single program.

7
8 21. The apparatus according to claim 17, wherein the demultiplexer further
9 extracts an entitlement control message (ECM) from the filtered transport stream.

10
11 22. The apparatus according to claim 17, wherein the means for receiving an
12 encrypted and filtered MPEG transport stream receives the encrypted and filtered
13 MPEG transport stream over an IEEE 1394 bus from the PVR or STB.

14
15 23. The apparatus according to claim 22, wherein the encrypted and filtered
16 MPEG transport stream is received as isochronous data over the IEEE 1394 bus.

17
18 24. The apparatus according to claim 17, wherein the MPEG table extracted by
19 the demultiplexer is sent to the PVR or STB over an IEEE 1394 bus.

20
21 25. The apparatus according to claim 24, wherein the MPEG table extracted by
22 the demultiplexer is sent to the PVR or STB as asynchronous data over the IEEE
23 1394 bus.

24
25 26. The apparatus according to claim 17, wherein the formatter receives the
26 MPEG table to be reinserted over an IEEE 1394 bus.

27
28 27. The apparatus according to claim 26, wherein the formatter receives the
29 MPEG table to be reinserted as asynchronous data over the IEEE 1394 bus.
30

1 28. An external storage device for a personal video recorder (PVR) or television
2 Set-Top Box (STB), comprising:
3 means for receiving an encrypted and filtered MPEG transport stream, the
4 filtered MPEG transport stream containing only components having content related
5 to a single program, wherein the encrypted and filtered MPEG transport stream is
6 received as isochronous data over an IEEE 1394 bus;
7 a decrypter that decrypts the encrypted and filtered MPEG transport stream
8 using 5C decryption to produce a filtered MPEG transport stream;
9 a demultiplexer that receives the filtered MPEG transport stream and extracts
10 MPEG tables comprising a program association table (PAT) and a program map
11 table (PMT) therefrom, and wherein the demultiplexer further extracts an
12 entitlement control message (ECM) from the filtered transport stream;
13 means for sending the MPEG tables extracted by the demultiplexer is sent
14 to the PVR or STB over the IEEE 1394 bus as asynchronous data;
15 a formatter that reinserts the MPEG PAT and PMT tables back into the
16 filtered MPEG transport stream to produce a modified MPEG transport stream, the
17 reinserted tables containing only information relevant to the single program,
18 wherein the formatter receives the MPEG table to be reinserted as asynchronous
19 data over the IEEE 1394 bus;
20 an encrypter that encrypts the modified transport stream using 5C
21 encryption;
22 a disc drive that stores the encrypted modified MPEG transport stream; and
23 a pass through switch for selectively bypassing the disc drive.
24
25

1 29. A method of storing data on a disc drive external to a personal video recorder
2 (PVR) or television Set-Top Box (STB), comprising:
3 receiving an MPEG transport stream;
4 filtering the MPEG transport stream to extract portions of the MPEG transport
5 stream relevant to a selected program;
6 encrypting the filtered MPEG transport stream;
7 sending the MPEG transport stream to the external disc drive;
8 at the external disc drive, decrypting the filtered MPEG transport stream;
9 removing an MPEG table from the filtered MPEG transport stream;
10 editing the MPEG table to remove information not relevant to the selected
11 program;
12 reinserting the edited table into the filtered MPEG transport stream to
13 produce a modified MPEG transport stream; and
14 storing the modified MPEG transport stream to the disc drive.

15
16 30. The method according to claim 29, further comprising encrypting the
17 modified transport stream.

18
19 31. The method according to claim 30, wherein the encrypting is prior to the
20 storing in the disc drive so that the disc drive stores an encrypted version of the
21 modified transport stream.

22
23 32. The method according to claim 30, wherein the encrypting comprises 5C
24 encrypting.

25
26 33. The method according to claim 29, wherein the MPEG table comprises at
27 least one of a program association table (PAT) and a program map table (PMT).
28

1 34. The method according to claim 29, wherein the removing comprises
2 extracting MPEG tables comprising a program association table (PAT) and a
3 program map table (PMT); and wherein the reinserting comprises reinserting the
4 MPEG PAT and PMT tables back into the filtered MPEG transport stream to
5 produce a modified MPEG transport stream, the reinserted tables containing only
6 information relevant to the single program.

7
8 35. The method according to claim 29, further comprising extracting an
9 entitlement control message (ECM) from the filtered transport stream and sending
10 the ECM to the PVR or STB.

11
12 36. The method according to claim 29, wherein the encrypted and filtered MPEG
13 transport stream is sent over an IEEE 1394 bus from the PVR or STB.

14
15 37. The method according to claim 36, wherein the encrypted and filtered MPEG
16 transport stream is sent as isochronous data over the IEEE 1394 bus.

17
18 38. The method according to claim 29, wherein the removed MPEG table is sent
19 to the PVR over an IEEE 1394 bus.

20
21 39. The method according to claim 38, wherein the removed MPEG table is sent
22 to the PVR as asynchronous data over the IEEE 1394 bus.

23
24 40. The method according to claim 29 wherein the MPEG table to be reinserted
25 is received from the PVR or STB over an IEEE 1394 bus.

26
27 41. The method according to claim 40, wherein the MPEG table to be reinserted
28 is received as asynchronous data over the IEEE 1394 bus.

1 42. A method of storing data on a disc drive external to a personal video recorder
2 (PVR) or television Set-Top Box (STB), comprising:
3 receiving an encrypted and filtered MPEG transport stream;
4 decrypting the filtered MPEG transport stream;
5 removing an MPEG table from the filtered MPEG transport stream;
6 sending the MPEG table to the PVR or STB;
7 receiving an edited table from the PVR or STB;
8 reinserting the edited table into the filtered MPEG transport stream to
9 produce a modified MPEG transport stream; and
10 storing the modified MPEG transport stream to the disc drive.
11

12 43. The method according to claim 42, further comprising encrypting the
13 modified MPEG transport stream prior to the storing in the disc drive, so that the
14 disc drive stores an encrypted version of the modified transport stream.
15

16 44. The method according to claim 43, wherein the encrypting comprises 5C
17 encrypting.
18

19 45. The method according to claim 42, wherein the MPEG table comprises at
20 least one of a program association table (PAT) and a program map table (PMT).
21

22 46. The method according to claim 42, wherein the removing comprises
23 extracting MPEG tables comprising a program association table (PAT) and a
24 program map table (PMT); and wherein the reinserting comprises reinserting the
25 MPEG PAT and PMT tables back into the filtered MPEG transport stream to
26 produce a modified MPEG transport stream, the reinserted tables containing only
27 information relevant to the single program.
28

1 47. The method according to claim 42, further comprising extracting an
2 entitlement control message (ECM) from the filtered transport stream and sending
3 the ECM to the PVR or STB.

4
5 48. The method according to claim 42, wherein the encrypted and filtered MPEG
6 transport stream is sent over an IEEE 1394 bus from the PVR or STB.

7
8 49. The method according to claim 48, wherein the encrypted and filtered MPEG
9 transport stream is sent as isochronous data over the IEEE 1394 bus.

10
11 50. The method according to claim 42, wherein the removed MPEG table is sent
12 to the PVR over an IEEE 1394 bus.

13
14 51. The method according to claim 50, wherein the removed MPEG table is sent
15 to the PVR as asynchronous data over the IEEE 1394 bus.

16
17 52. The method according to claim 42 wherein the MPEG table to be reinserted
18 is received from the PVR over an IEEE 1394 bus.

19
20 53. The method according to claim 52, wherein the MPEG table to be reinserted
21 is received as asynchronous data over the IEEE 1394 bus.

1 54. A method of storing data from a Personal Video Recorder (PVR) or television
2 Set-Top Box to an external storage device, comprising:

3 filtering an MPEG transport stream to remove components that do not
4 contain information related to a selected program;

5 encrypting the MPEG transport stream to produce a filtered and encrypted
6 MPEG transport stream;

7 sending the filtered and encrypted MPEG transport stream to the external
8 storage device;

9 receiving an MPEG table from the external storage device;

10 editing the MPEG table to remove information not related to the selected
11 program; and

12 sending the edited table to the external storage device.

13
14 55. The method according to claim 54, wherein the encrypting comprises 5C
15 encrypting.

16
17 56. The method according to claim 54, wherein the MPEG table comprises at
18 least one of a program association table (PAT) and a program map table (PMT).

19
20 57. The method according to claim 54, wherein the receiving comprises
21 receiving MPEG tables comprising a program association table (PAT) and a
22 program map table (PMT); and wherein the reinserting comprises reinserting the
23 MPEG PAT and PMT tables back into the filtered MPEG transport stream to
24 produce a modified MPEG transport stream, the reinserted tables containing only
25 information relevant to the single program.

26
27 58. The method according to claim 54, further comprising receiving an
28 entitlement control message (ECM) from the PVR or STB.

1 59. The method according to claim 54, wherein the encrypted and filtered MPEG
2 transport stream is sent over an IEEE 1394 bus to the external storage device.

3
4 60. The method according to claim 59, wherein the encrypted and filtered MPEG
5 transport stream is sent as isochronous data over the IEEE 1394 bus.

6
7 61. The method according to claim 54, wherein the MPEG table is received by
8 the PVR or STB over an IEEE 1394 bus.

9
10 62. The method according to claim 54, wherein the MPEG table is received by
11 the PVR or STB as asynchronous data over the IEEE 1394 bus.

12
13 63. The method according to claim 54 wherein the edited MPEG table is sent
14 from the PVR or STB over an IEEE 1394 bus.

15
16 64. The method according to claim 63, wherein the edited MPEG table is
17 received as asynchronous data over the IEEE 1394 bus.
18

1 65. An electronic storage medium storing instructions which, when executed on
2 a programmed processor, carry out a method of storing data on a disc drive
3 external to a personal video recorder (PVR) or television Set-Top Box, comprising:
4 receiving an MPEG transport stream;
5 filtering the MPEG transport stream to extract portions of the MPEG transport
6 stream relevant to a selected program;
7 encrypting the filtered MPEG transport stream;
8 sending the MPEG transport stream to the external disc drive;
9 at the external disc drive, decrypting the filtered MPEG transport stream;
10 removing an MPEG table from the filtered MPEG transport stream;
11 editing the MPEG table to remove information not relevant to the selected
12 program;
13 reinserting the edited table into the filtered MPEG transport stream to
14 produce a modified MPEG transport stream; and
15 storing the modified MPEG transport stream to the disc drive.
16

1 66. An electronic storage medium storing instructions which, when executed on
2 a programmed processor, carry out a method of storing data on a disc drive
3 external to a personal video recorder (PVR) or television Set-Top Box, comprising:
4 receiving an encrypted and filtered MPEG transport stream;
5 decrypting the filtered MPEG transport stream;
6 removing an MPEG table from the filtered MPEG transport stream;
7 sending the MPEG table to the PVR or STB;
8 receiving an edited table from the PVR or STB;
9 reinserting the edited table into the filtered MPEG transport stream to
10 produce a modified MPEG transport stream; and
11 storing the modified MPEG transport stream to the disc drive.
12

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1 67. An electronic storage medium storing instructions which, when executed on
2 a programmed processor, carry out a method of storing data from a Personal Video
3 Recorder (PVR) or television Set-Top Box (STB) to an external storage device,
4 comprising:

5 filtering an MPEG transport stream to remove components that do not
6 contain information related to a selected program;

7 encrypting the MPEG transport stream to produce a filtered and encrypted
8 MPEG transport stream;

9 sending the filtered and encrypted MPEG transport stream to the external
10 storage device;

11 receiving an MPEG table from the external storage device;

12 editing the MPEG table to remove information not related to the selected
13 program; and

14 sending the edited table to the external storage device.
15

1 68. A digital storage device, comprising:
2 a disc drive;
3 an interface that receives an IEEE 1394 isochronous data stream containing
4 encrypted data formatted as an MPEG transport stream into the digital storage
5 device;
6 a decrypter that decrypts the encrypted data;
7 means for storing the data on the disc drive; and
8 an encrypter that encrypts the data for transport out of the digital storage
9 device as an IEEE 1394 isochronous data stream.

10
11 69. The apparatus according to claim 68, wherein the MPEG transport stream
12 contains only information related to a selected program.

13
14 70. The apparatus according to claim 68, wherein the encrypter encrypts the
15 MPEG transport stream prior to storage in the disc drive so that the disc drive
16 stores an encrypted version of the MPEG transport stream.

17
18 71. The apparatus according to claim 68, wherein the encrypter encrypts the
19 data using 5C decryption.

20
21 72. The apparatus according to claim 68, wherein the decrypter decrypts the
22 data using 5C decryption.

23
24 73. The method according to claim 68, further comprising:
25 a demultiplexer that removes an MPEG table from the MPEG transport
26 stream; and
27 a formatter that reinserts an MPEG table back into the MPEG transport
28 stream to produce a modified MPEG transport stream, the reinserted table
29 containing only information relevant to a selected program.

1 74. The apparatus according to claim 73, wherein the MPEG table comprises
2 at least one of a program association table (PAT) and a program map table (PMT).
3

4 75. The apparatus according to claim 73, wherein the demultiplexer extracts
5 MPEG tables comprising a program association table (PAT) and a program map
6 table (PMT); and wherein the formatter reinserts the MPEG PAT and PMT tables
7 back into the MPEG transport stream to produce the modified MPEG transport
8 stream, the reinserted tables containing only information relevant to the selected
9 program.
10

11 76. The apparatus according to claim 73, wherein the demultiplexer further
12 extracts an entitlement control message (ECM) from the filtered transport stream.
13

14 77. The apparatus according to claim 73, wherein the MPEG table extracted by
15 the demultiplexer is transmitted as asynchronous data over the IEEE 1394 bus.
16

17 78. The apparatus according to claim 73, wherein the formatter receives the
18 MPEG table to be reinserted as asynchronous data over the IEEE 1394 bus.
19

20 79. The apparatus according to claim 68, further comprising a pass through
21 switch for selectively bypassing the disc drive.
22
23